

THE INVENTION CLAIMED IS:

1. A method of depositing a bioactive material on a substrate comprising:  
depositing a plurality of droplets of a bioactive material at a first concentration in a  
fluid to form a spot on the substrate, the spot having a first bioactivity level;  
5 and  
controlling the plurality of droplets to control the size of the spot and control the  
bioactivity level of the spot to not be equal to the number of droplets times the  
first bioactivity level.
2. The method as claimed in claim 1 additionally comprising:  
10 preventing the plurality of droplets from drying between droplets; and  
controlling the plurality of droplets to change the size of the spot and to control the  
bioactivity level of the spot.
3. The method as claimed in claim 1 additionally comprising:  
allowing the plurality of droplets to dry on the substrate between the droplets; and  
15 controlling the plurality of droplets to control the spot at least at substantially the first  
size and to change the bioactivity level of the spot.
4. The method as claimed in claim 1 additionally comprising:  
the depositing of the plurality of droplets with at least two droplets being in a set of  
droplets and subsequent droplets in sets of at least two droplets;  
20 allowing the droplets in the sets of droplets to remain wet on the substrate; and  
allowing the droplets to dry on the substrate in between sets of droplets.
5. The method as claimed in claim 1 additionally comprising:  
providing a first multiplicity of droplets of the bioactive material at the first  
concentration in the fluid simultaneously on the substrate to form a  
25 multiplicity of spots having sizes substantially equal to the first size; and  
providing a second multiplicity of droplets of the bioactive material at the first  
concentration in a fluid simultaneously on the multiplicity of spots while  
maintaining the multiplicity of spots at least at substantially the first size to  
form a high-density biomaterial spot micro array.

6. The method as claimed in claim 1 wherein:

the depositing of the plurality of droplets maintains the spot at least at substantially the size of the spot of a first droplet and has the bioactivity levels at least one of increasing non-linearly, decreasing non-linearly, linear for only a portion of the plurality of droplets, and a combination thereof.

7. The method as claimed in claim 1 wherein:

the depositing of the plurality of droplets increases the bioactivity level of the spot to more than the number of droplets times the first bioactivity level.

8. The method as claimed in claim 1 additionally comprising:

providing the bioactive material in the fluid in a standard concentration; and processing the bioactive material in the fluid with a buffer to modify the standard concentration to provide the first concentration in the fluid.

9. The method as claimed in claim 1 wherein:

the depositing of the plurality of droplets deposits at least one of a protein, a peptide, a reagent, an enzyme, a gene, a DNA, and a combination thereof.

10. The method as claimed in claim 1 wherein:

the depositing of the plurality of droplets is performed by ejecting the droplets from a liquid handling system.

11. A method of depositing a bioactive material on a substrate comprising:

depositing a plurality of droplets of substantially equal volume of a bioactive material at a first concentration in a fluid to form a spot on the substrate, the spot having a first bioactivity level; and

controlling the plurality of droplets to control the size of the spot and control the bioactivity levels of the spot to be at least one of increasing non-linearly, decreasing non-linearly, linear for only a portion of the plurality of droplets, and a combination thereof.

12. The method as claimed in claim 11 additionally comprising:

preventing the plurality of droplets from drying between droplets; and controlling the plurality of droplets to increase the size of the spot and to increase the bioactivity level of the spot.

13. The method as claimed in claim 11 additionally comprising:  
allowing the plurality of droplets to dry on the substrate between the droplets; and  
controlling the plurality of droplets to maintain the size of the spot at least at  
substantially the first size and to increase the bioactivity level of the spot.

5 14. The method as claimed in claim 11 wherein:  
the depositing of the plurality of droplets with a number of droplets being in a set of  
droplets and subsequent droplets in sets of the same number of droplets;  
allowing the droplets in the sets of droplets to remain wet on the substrate; and  
allowing the droplets to dry on the substrate in between sets of droplets.

10 15. The method as claimed in claim 11 additionally comprising:  
providing a first multiplicity of droplets of the bioactive material at the first  
concentration in the fluid simultaneously on the substrate to form a  
multiplicity of spots having sizes substantially equal to the first size;  
providing a second multiplicity of droplets of the bioactive material at the first  
15 concentration in a fluid simultaneously on the multiplicity of spots while  
maintaining the multiplicity of spots at least at substantially the first size to  
form a high-density biomaterial spot micro array; and  
using the high-density biomaterial spot micro array to perform a biological test.

20 16. The method as claimed in claim 11 wherein:  
the depositing of the plurality of droplets maintains the spot at least at substantially  
the size of the spot of a first droplet and has the bioactivity levels at least one  
of increasing non-linearly above the number of droplets times the first  
bioactivity level.

25 17. The method as claimed in claim 11 additionally comprising:  
the depositing of the plurality of droplets increases the bioactivity level of the spot to  
a multiple of the number of droplets times the first bioactivity level; and  
using the spot on the substrate to perform a biological test.

30 18. The method as claimed in claim 11 additionally comprising:  
providing the bioactive material in the fluid in a standard concentration; and  
processing the bioactive material in the fluid with a printer buffer to dilute the  
standard concentration to provide the first concentration in the fluid.

19. The method as claimed in claim 11 wherein:  
depositing the bioactive material deposits at least one of a protein, a peptide, a  
reagent, an enzyme, a gene, a DNA, and a combination thereof; and  
using the bioactive material on the substrate to perform a biological test.

5 20. The method as claimed in claim 11 wherein:  
depositing the plurality of droplets is performed by ejecting the droplets from an ink  
jet printing system.